

# A 4 Square Meter High Aspect Ratio X Band Antenna for Small Satellites, Phase I

Completed Technology Project (2018 - 2019)



## Project Introduction

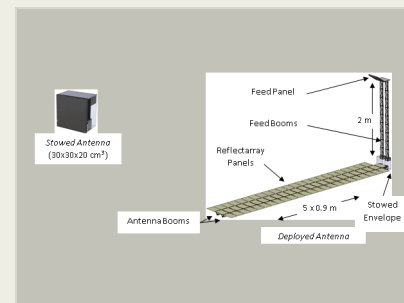
Novel technologies are desired to meet evolving demand for remote microwave sensors. Specifically, a large-aperture, active antenna which stows into a compact volume on each spacecraft of a satellite constellation can reduce the number of satellites required to adequately sample a given measurement. Indeed, with a lower satellite count, a significant economic benefit can be realized with the cost savings associated with the corresponding reduced launch burden.

MMA Design LLC proposes to advance the state-of-the-art in large-aperture, high-aspect ratio technologies by developing a deployable Synthetic Aperture Radar (SAR) antenna applicable to a MicroSat form factor using reflectarray rigid panels. The Large Aperture Rigid Antenna (LARA), stows efficiently in an 1800-cm<sup>3</sup> volume (30 cm × 30 cm × 20 cm) and reliably deploys forming a 4.5-m<sup>2</sup> aperture with a 5.6:1 aspect ratio.

## Anticipated Benefits

The antenna is enabling to constellations of SmallSat SARs for rapid temporal repeat imaging and bistatic/multistatic SAR configurations operating as single pass and repeat pass interferometers. **This science would further our understanding of climate variability and change as the basis of technology development identified in the 2016 Microwaves and Technologies Review and Strategy document by opening up daily cycles for study in addition to longer seasonal and yearly cycles.**

A high aspect ratio antenna traversing the earth in a low altitude orbit supports a larger swath area coverage on the ground. This has applications in both military and commercial remote sensing applications. This approach to obtaining a high compaction ratio antenna will also scale to larger satellite platforms such as ESPA class and support a broad range of frequencies of interest from UHF through Ku band with additional enhancements



A 4 Square Meter High Aspect Ratio X Band Antenna for Small Satellites, Phase I

## Table of Contents

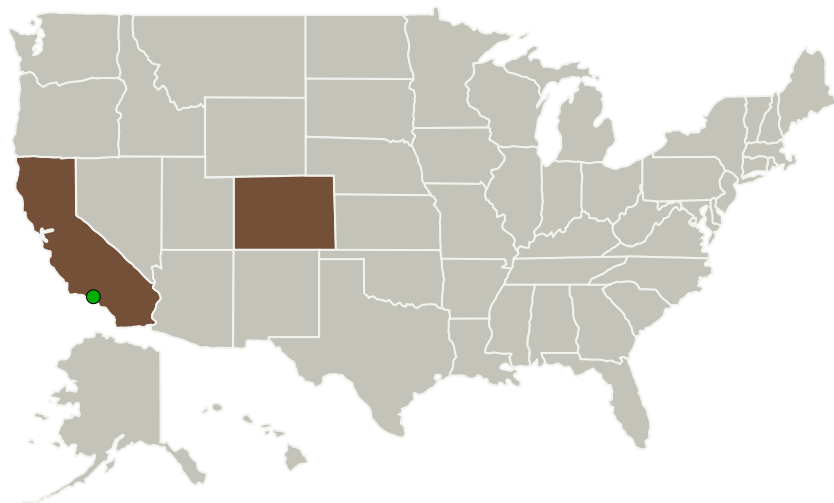
Project Introduction	1
Anticipated Benefits	1
Primary U.S. Work Locations and Key Partners	2
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Images	3
Technology Areas	3
Target Destination	3

# A 4 Square Meter High Aspect Ratio X Band Antenna for Small Satellites, Phase I

Completed Technology Project (2018 - 2019)



## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
MMA Design LLC	Lead Organization	Industry	Loveland, Colorado
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	Colorado

## Project Transitions

**July 2018:** Project Start**February 2019:** Closed out

### Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140876>)

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Organization:

MMA Design LLC

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

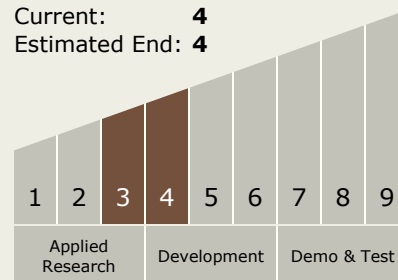
Carlos Torrez

### Principal Investigator:

Timothy Ring

## Technology Maturity (TRL)

Start: **3**  
 Current: **4**  
 Estimated End: **4**

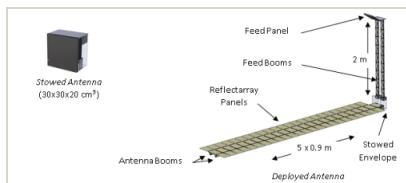


# A 4 Square Meter High Aspect Ratio X Band Antenna for Small Satellites, Phase I

Completed Technology Project (2018 - 2019)



## Images



### Briefing Chart Image

A 4 Square Meter High Aspect Ratio X Band Antenna for Small Satellites, Phase I  
(<https://techport.nasa.gov/image/135252>)

### Final Summary Chart Image

A 4 Square Meter High Aspect Ratio X Band Antenna for Small Satellites, Phase I  
(<https://techport.nasa.gov/image/127930>)

## Technology Areas

### Primary:

- TX08 Sensors and Instruments
  - └ TX08.1 Remote Sensing Instruments/Sensors
    - └ TX08.1.4 Microwave, Millimeter-, and Submillimeter-Waves

## Target Destination

Earth